Title: Does Music Calm the Savage Beast?

Brief Overview:

In this unit, the students will learn the effects of music on their heart rate (beats per minute, BPM). The students will use the CBL, TI83 graphics calculator, and the heart rate monitor to determine changes in the heart rate after listening to certain forms of music for a specified period of time. The students will use the data collected to form a scatter plot and determine the correlation between amount of time listening to a music type and the heart rate (BPM).

Links to NCTM Standards:

- **Mathematics as Problem Solving**
  Students will demonstrate their ability to work as a team, collect, organize and graph data, and make inferences based on the data.

- **Mathematics as Communication**
  Students will discuss their beliefs about the relationship between music and heart rate in small groups; students will work together to conduct activity; and students will use graphs, data collected, and conclusion formed from data to formulate a report of the effect of music on heart rate.

- **Mathematics as Reasoning**
  Students will analyze scatter plots to make determination of positive, negative, or no correlation.

- **Statistics**
  Students will learn the meaning of correlation by drawing inferences from the data that model real-world examples, and students will conduct an experiment based on the need to collect statistics to form data to analyze and use against the hypothesis.

- **Algebra**
  Students will use graphs as a tool to analyze data and construct equations.

Grade/Level:

Grades 9-12; Algebra I, Integrated Math I

Duration/Length:

This activity will take approximately 2-3 days to complete, depending on length of class.

Prerequisite Knowledge:

Students should have working knowledge of the following:

- TI83 graphics calculator
- CBL unit
- Reading and analyzing graphs
- Determining correlation from graph

Objectives:

Students will:

- work cooperatively in groups.
- follow instructions and guidelines of unit.
- produce scatter plots for each music type.
- evaluate scatter plots to determine correlation.
- write report on findings.

Materials/Resources/Printed Materials:

- TI83 graphing calculator
- TI CBL unit
- Vernier Heart Rate Monitor
- Boom Box or Walkmans
- Cassette tape containing at least three types of music (Hip-Hop, Rock, Meditation music, Classical, etc.)

Development/Procedures:

- Instruct students to describe the feelings they get when listening to certain types of music and have someone write these descriptions on the board.
- Play some music and have the students describe how the music makes them feel.
- Describe to the class the theory that there is a relationship between heart rate and certain types of music. Do they believe that this theory is true or not? (Discuss)
- Hand out the materials needed to conduct the experiment and instruct the class as to their responsibilities for the activity.
- Demonstrate to the class how to connect the CBL to the TI83 and the heart rate monitor to the CBL and the heart rate monitor to their ear lobe.
- On the overhead projector, show how to run the CMBHEART program and do a trial run so the class can see what to expect when they do the experiment themselves.

Evaluation:

See Teacher checklist for assessment parameters on the last page.

Extension/Follow Up:

- Some students will run in place for one minute and then listen to meditation music; the rest will run in place for one minute and not listen to any music. We will examine the rate at which the BPM decreases between the two groups and discuss our findings.
- Students will draw a fitted line for their scatter plots and determine the slope and equation of that line.

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DOES MUSIC CALM THE SAVAGE BEAST?

INSTRUCTION SHEET

1. Hook up the CBL, TI83, and heart rate monitor as your teacher has shown you.

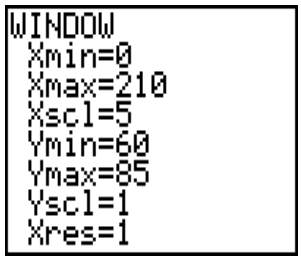
2. Turn your CBL unit and calculator on.

3. Press PRGM on the calculator and choose CMBHEART from the menu.

4. Follow the directions carefully as stated on the screen. Make sure the CBL and TI83 are linked and the heart monitor is hooked up to the CBL unit. Be sure to select EAR CLIP.

5. Set the ear clip in place and press enter. DO NOT START THE MUSIC YET!!! Monitor heart rate for 30 seconds and then let the subject turn the music on. Monitor the heart rate with music for 3 minutes.

6. After time is up, select menu choice 4(return) and proceed to set up your window as follows:



7. Then press GRAPH and observe the scatter plot to see if you notice any correlation.

DOES MUSIC CALM THE SAVAGE BEAST?
ACTIVITY SHEET

1. In the space provided, construct a drawing of your scatter plot:

2. Does your scatter plot show positive, negative, or no correlation between heart rate and the amount of time you listen to music?_____

_____

_____

3. Does your scatter plot support or disprove the Hypothesis that “Music Calms the Savage Beast”?_____

_____

_____

_____

_____

4. Are there any outliers in your scatter plot? If so, write them in the space provided_____

_____

5. Write a brief conclusion statement based on your analysis of the data._____

_____

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_____

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Teacher Checklist:

	YES	NO
1. Did group follow all directions as stated and produce a scatter plot?	___	___
2. Did the group determine correctly the correlation based on their graph?	___	___
3. Did the group notice any outliers that existed?	___	___
4. Did the group's conclusion accurately reflect data analysis and graph?	___	___
5. Did the group put away all materials neatly and properly and clean their area?	___	___
6. Did the group work positively and cooperatively on this activity?	___	___